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SECTION 404 PERMIT COMMENTS (LEDPA)
WaterLegacy DRAFT (12-8-15)

I. No Clean Water Act Section 404 permit may be granted for the PolyMet NorthMet project because it is not the least environmentally damaging practicable alternative.

Federal guidelines enacted pursuant to the Section 404 of the Clean Water Act (CWA), 33 U.S.C. §1344, clearly prohibit the U.S. Army Corps of Engineers (Corps) from issuing permits for activities involving the dredge and fill of wetlands “if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem so long as the alternative does not have other significant adverse environmental consequences.” 40 C.F.R. §230.10(a). An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes, §230.10(a)(2). Where an activity associated with a discharge to wetlands does not require siting within wetlands to fulfill its basic purpose (i.e., is not “water dependent”) practicable alternatives that do not involve special aquatic sites are presumed to be available, unless clearly demonstrated otherwise, and all practicable alternatives to the proposed discharge which do not involve a discharge into a special aquatic site are presumed to have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise. §230.10(a)(3).

Under the CWA, the test is not whether a proposed project is "better" than an alternative with less wetlands impact because it would cost less and have less impact on existing and future development. The test is whether the alternative with less wetlands impact is "impracticable," and the burden is on the applicant, with independent verification by the Corps, to provide detailed, clear and convincing information *proving* impracticability. The CWA prevents the Corps from issuing a § 404(b) permit if there is a less damaging practicable alternative. *Utahns v. U.S. Dep't of Transportation*, 305 F.3d 1152 (10th Cir. 2002)

In actions subject to the National Environmental Policy Act (NEPA), where the Corps of Engineers is the permitting agency, the analysis of alternatives required for NEPA environmental documents will in most cases provide the information for the evaluation of alternatives under Section 404 regulations. However it is not presumed that information presented in NEPA documents is definitive. Where the NEPA documents have not considered the alternatives in sufficient detail to respond to the requirements of these regulations, it may be necessary to supplement these NEPA documents with this additional information. 40 C.F.R. §(a)(4). The final

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environmental impact statement (FEIS) for the PolyMet NorthMet project has not demonstrated that the Proposed Action is the least environmentally damaging practicable alternative (LEDPA) for the NorthMet project.

All PolyMet NorthMet project impacts result from activities associated with dredge or fill of wetlands. The NorthMet mine site would directly destroy 758.2 acres of wetlands (FEIS 5-266, Table 5.2.3-1) and indirectly impact as many as 5,720 additional acres of wetlands. (FEIS, App. C, autop. 2994). The transportation and utility corridor planned for the mine would directly destroy another 7.2 acres of wetlands (FEIS, 5-266, Table 5.2.3-1) and potentially impact up to 534 acres as the result of spillage of ores. (FEIS, 5-314)

The NorthMet tailings site would directly destroy 148.4 acres of wetlands (FEIS, 5-322, Table 5.2.3-8) and potentially impact thousands of additional acres of wetlands as the result of dewatering from seepage collection, sulfate deposition and seepage impacts on water quality. (See FEIS, 5-333, Table 5.2.3-10; 5-345, Table 5.2.3-12).

The NorthMet hydrometallurgical residue facility (HRF) would dredge and fill 36.1 acres of wetlands, directly destroying 7.5 acres of marsh wetlands subject to state and federal regulatory jurisdiction. (FEIS, 5-321, Figure 5.2.3-19).

Pursuant to rule, the requirement to demonstrate that the project alternative selected provides the least environmental damaging practicable alternative applies to each of these facilities as well as to the Proposed Action as a whole.

A. The Section 404 and environmental review process conflated private and public roles, constraining consideration of the least environmentally damaging practicable alternative for the Proposed Action.

PolyMet’s revised Section 404 Wetland Permit Application submitted on August 19, 2013 (FEIS ref. PolyMet 2013o) explicitly relied on the environmental impact statements not yet prepared by Minnesota Department of Natural Resources (MDNR), the Army Corps and the U.S.D.A. (Forest Service) to provide information needed for a Section 404 permit application, including an analysis of any alternatives other than changes in project configuration to reduce direct wetlands impacts. (*Id.*, pp. 7, 14, 31). The Application summarized a process that took place after the release of the draft environmental impact statement (DEIS) in 2009, whereby the Co-Lead Agencies “developed and approved a process to identify and assist PolyMet to develop

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revisions to its proposal” that responded to concerns raised in comments on the DEIS. This process developed a “draft Project alternative” that would be carried forward in environmental review to meet the requirement of identifying the least environmentally damaging practicable alternative, among other goals. (*Id.*, pp. 33-34). The Forest Service Draft Record of Decision similarly explains that, after issuing the DEIS, the Co-lead Agencies, in response to agency and public comments, “developed an alternative proposal in consultation with PolyMet that sought to resolve several major environmental concerns and permitting barriers raised during the DEIS process,” which “alternative was subsequently adopted by PolyMet and became the current NorthMet Mining Project Proposed Action.”¹

There need not be any subjective lack of impartiality in this process. The objective record in the SDEIS and FEIS reflects inadequate analysis of environmental impacts and failure to analyze less environmentally damaging alternatives once the Co-Lead Agencies’ “draft Project alternative” had been adopted by PolyMet. The analysis of impacts and alternatives under NEPA may have served only to justify decisions already made. 40 C.F.R. §1502.2 (g). *Nat’l Audubon Soc’y v. Dep’t of the Navy*, 422 F. 3d 174, 199 (4th Cir. 2005); *Davis v. Mineta*, 302 F. 3d 1104, 1120 (10th Cir. 2002). Compliance with Section 404 regulations may also have been undermined.

An example of the conflation of private and public purposes is provided by reviewing the purpose and need for the PolyMet NorthMet proposal. As initially defined in the Final Scoping Decision, the Co-Lead Agencies’ purpose and need would be broadly applicable to sites that did not require wetlands destruction and degradation. It stated, “The purpose of the NorthMet mining and ore processing project is to produce copper metal, precious metal concentrates, and nickel-cobalt concentrates for sale to the world market by uninterrupted operation of the facility for the life of the mine.” (PolyMet Draft EIS, App. B, Final Scoping Decision Document, Oct. 25, 2005, p. 2)²

This definition of the project purpose would allow consideration of other mine sites for production of metals, particularly since the deposit of copper, nickel and other metals is recognized to be broadly-disseminated in the Duluth Complex deposit across significant portions of Northeast Minnesota. (See MDNR, Exploration for Metallic Mineral Resources: Copper,

¹ U.S.F.S., Draft Record of Decision, NorthMet Land Exchange, November 2015, p. 4 available at [web]

² The PolyMet FEIS reference, MDNR and USACE 2009, does not include the appendices to the Draft EIS. They can be found at http://www.dnr.state.mn.us/input/environmentalreview/polymet/eis_toc.html

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Nickel and Platinum Group Metals, Duluth Complex Map, Exhibit 32).³ Arguably, such consideration is required under federal regulations.

As described above, when an activity associated with discharge to wetlands does not require siting within wetlands to fulfill its basic purpose -- i.e., is not “water dependent,” practicable alternatives that do not involved discharge into wetlands are presumed to be available and are presumed to have less impact on the aquatic system. 40 C.F.R. 230.10(a)(3). “If the activity is not “water dependent,” the guidelines require that the Corps apply a presumption that a practicable alternative that has less adverse environmental impact on the wetland is available,” and the applicant bears the burden of providing “detailed, clear and convincing information *proving*” that an alternative with less adverse impact is impracticable. *Sierra Club v. Van Antwerp*, 362 Fed. Appx. 100,106 (11th Cir. 2010) (Vacating Section 404 permits issued without applying presumptions). Cf. *Buttrey v. United States*, 690 F.2d 1170, 1180 (5th Cir. 1982), *cert. denied*, 461 U.S. 927 (1983); *Bersani v. Robichaud*, 850 F. 2d 36 (2nd Cir. 1988), *cert. denied* 489 U.S. 1089 (1989); *Bahia Park v. U.S.A.*, 286 F. Supp. 2d 201 (D. P.R. 2003).

The purpose and need of the Co-Lead Agencies described in the FEIS, however, has become nearly indistinguishable from that of the project proponent. PolyMet’s stated purpose is “to exercise PolyMet’s mineral lease to continuously mine, via open pit methods, the known ore deposits (NorthMet Deposit) containing copper, nickel, cobalt, and PGEs to produce base and precious metal precipitates and flotation concentrates by uninterrupted utilization of the former LTVSMC processing plant.” (FEIS, 1-11). The purpose and need of the Co-Lead Agencies now focuses specifically on PolyMet’s leasing interests:

The Purpose and Need for the Proposed Actions is . . . For PolyMet to utilize its leased mineral rights and recover commercial quantities and quality of semi-refined metal concentrates, hydroxides, and precipitates from the NorthMet ore body in northern Minnesota, and to process the recovered ore by reutilizing the former LTVSMC processing plant. (FEIS, 1-11).

The conflation of private and public purpose would foreclose consideration of alternative mine sites to prevent destruction and degradation of wetlands. The record suggests that this process may have also deprived Co-Lead Agencies of the independence required to consider

³ The term “Exhibits,” unless otherwise noted, refers to WaterLegacy Exhibits submitted on December 14, 2015 with FEIS and Section 404 Comments. The MDNR map in Exhibit 32 is available at http://files.dnr.state.mn.us/lands_minerals/mpes_projects/mnmin_copper_map_2015.pdf

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other less environmentally damaging practicable alternatives to the Proposed Action described below and to assess substantial adverse impacts of the Proposed Action on wetlands, water quality, downstream aquatic ecosystems and human health.

B. The Underground Mining Alternative would have less adverse impact on the aquatic ecosystem and it has not been demonstrated it is impracticable.

The Scoping Decision for the PolyMet proposal required evaluation of underground mining, specifying that underground mining could be eliminated only if it were infeasible, but if underground mining merely provided a lower economic return, a detailed assessment must be prepared. (PolyMet DEIS Appx. B, Final Scoping Decision Document, “PolyMet Scoping Decision”, p. 5 of 45)⁴

It is undisputed that the Underground Mining Alternative is available and technically feasible. (FEIS App. B, Co-Lead Agencies, Underground Mining Alternative Assessment for the NorthMet Mining Project and Land Exchange Environmental Impact Statement, Sept. 27, 2013, “Underground Mining Assessment,” p. 4, FEIS autop. 2881 et seq.)

It is also undisputed that the Underground Mining Alternative would offer significant environmental benefits over the proposed open-pit mine. The Co-Lead Agencies have agreed:

Compared to the proposed open pit mine, the underground mining alternative would offer some significant environmental benefits, including:

- fewer direct effects on surface resources, including wetlands;
 - less mine dewatering and, therefore, less water to be managed;
 - less waste rock, which would result in:
 - a smaller surface footprint; and
 - reduced effects on surface water and groundwater.
 - less ore mined at a slower rate, which would result in:
 - less tailings and hydrometallurgical residue to be managed;
 - fewer effects on surface water and groundwater; and
 - reduced air emissions from mining, transporting, and processing the ore, and constructing the Tailings Basin and Hydrometallurgical Residue Facility.
- (*Id.*, p. 3, FEIS autop. 2887)

The FEIS, similarly, states that an underground mine would result in a “smaller surface footprint, thus offering environmental benefits over the NorthMet Project Proposed Action

⁴ The PolyMet SDEIS reference, MDNR and USACE 2009, does not include the appendices to the DEIS. They can be found at http://www.dnr.state.mn.us/input/environmentalreview/polymet/eis_toc.html.

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through reduced effects on wetlands, vegetation, and wildlife habitat.” The Underground Mine Alternative would also have lower production rates compared to the proposed open pit, resulting in less fugitive air emissions, and less waste rock and processing waste (tailings and hydrometallurgical residue), thus “reducing the scale and duration of potential water quality effects.” (FEIS, 3-160)

The FEIS, like the SDEIS before it, states that underground mining was eliminated as an alternative to the Proposed Action “because it was found to be economically infeasible” in the 2013 analysis provided in Appendix B to the FEIS. (FEIS, 3-184). This analysis included both the Co-Leads’ Underground Mining Assessment and an October 2012 report, “Economic Assessment of Conceptual Underground Mining Option for the NorthMet Project” prepared for PolyMet by a consultant to Foth Infrastructure & Environment, LLC. (“Foth Report” provided in FEIS, App. B, autop. 2897 *et. seq.*)

On first blush, this statement would seem to suggest that underground mining is impracticable. However, closer scrutiny demonstrates that the analysis of economic feasibility was based on an unreasonably narrow definition of the potential project and failed to assess actual project costs under the Proposed Action, including long-term treatment requirements. This analysis is sufficiently unreliable that it cannot support rejection of the underground mining alternative as the least environmentally damaging practicable alternative for the NorthMet project. 40 C.F.R. §230.10(a).

The Foth Report constrained its analysis of “NorthMet deposit” to include only the measured and indicated resources within the open pit identified by PolyMet. (Foth Report, p. 3, FEIS App. B., autop. 2905), even while acknowledging that this constraint excludes most mineralized rock that could be available for underground mining:

There is mineralized rock outside of the volume of rock contained within the proposed open-pit. This mineralized rock occurs below the open-pit. While this mineralized rock is excluded from this report, speculatively it may be possible for it to be economically viable to extract decades in the future. Only approximately 10% of the measured and indicated resource is below the open-pit (Poly Met, 2007). The majority of inferred resource defined by Poly Met (2007) is below the open-pit. (*Id.*).

The extent of mineralized rock that occurs below the open-pit is illustrated in slides

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presented by PolyMet to investors in May 2012 and May 5, 2015.⁵ The majority of above average ore grade mineralization in the Unit 1 Main Ore Body is plainly evident outside the open-pit boundary line.

Restriction of alternatives analysis to the mineral resources within the open pit specified by PolyMet (FEIS, 3-159) served the project proponent's interests, while excluding the reasonable alternative of underground mining. This constraint violates NEPA and precludes a finding that the Underground Mining Alternative is not the LEDPA. "A federal agency may not adopt a private party's interests as its own and exclude alternatives that fail to meet specific private objectives." *Nat'l Parks & Conservation Ass'n v. BLM, supra*, 606 F. 3d at 1072. "If the agency constricts the definition of the project's purpose and thereby excludes what truly are reasonable alternatives, the EIS cannot fulfill its role." *Simmons v. United States Army Corps of Eng'rs*, 120 F.3d 664, 666 (7th Cir. 1997).

In addition, the cost assessment provided by PolyMet's consultant and adopted by the Co-Lead Agencies is insufficient to conclude that underground mining is economically infeasible, since it failed to compare Underground Mining Alternative costs to actual costs of the NorthMet proposed action.

On May 15, 2012, the EPA cautioned that mine capital and operating cost numbers previously used to determine feasibility were out-of-date and did not consider PolyMet's mitigation and treatment costs. The EPA also noted that the Co-Leads' position paper did not factor into its analysis the potential that the applicant would in the future "mine higher-grade minerals that are located deeper than the proposed mine pit."⁶ EPA's letter sent two weeks later stated that this Co-Leads' position paper should be revised so that "updated environmental and economic data that compares costs of both pit mining and underground mining options" could inform the selection of a preferred project alternative.⁷

Despite these concerns, PolyMet's consultant did not include any actual operating or pre-production capital costs from the PolyMet mine project in the analysis; all are published cost models. (Underground Mine Assessment, p. 6, FEIS autop. 2890). While adjustments were

⁵ See PolyMet, Presentation to InvestMnt Conference, Minneapolis, May 14, 2012, Excerpts, NorthMet Ore Body slide, p. 2 of Exhibit 48 to WaterLegacy SDEIS Exhibits in Appendix – SDEIS Materials and PolyMet, Copper, Nickel & Precious Metals in the U.S., May 2105, slide, p. 2, attached herein as Exhibit 33.

⁶ M. Sedlacek, EPA Letter to Co-Lead Agencies re underground mining, May. 15, 2012, p. 2, Exhibit 46 to WaterLegacy SDEIS comments contained in Appendix - SDEIS Materials.

⁷ K. Westlake, EPA Letter to Co-Lead Agencies re underground mining, May. 31, 2012, p. 2, Exhibit 47 to WaterLegacy SDEIS comments contained in Appendix - SDEIS Materials.

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made from the cost models, such as InfoMine, to account for obvious differences with a possible NorthMet setting, “there is no assurance these adjustments are adequate.” (Foth Report, p. 6, FEIS autop. 2908).

Without a comparison of underground mining to actual NorthMet project, mitigation and long-term treatment costs, there is no way for decision-makers or the public to determine if the Underground Mining Alternative is merely less profitable than the Proposed Action, rather than impracticable or whether the cost calculation favors the Proposed Action due to disregarding or externalizing to the public the long-term costs of the Proposed Action. The FEIS record is insufficient to support a Section 404 determination that the Underground Mine Alternative is not the least environmentally damaging practicable alternative for the PolyMet NorthMet project.

C. Dry stack tailings disposal on an alternative site would have less adverse impact on the aquatic ecosystem, and it is presumed that other sites are practicable and less impactful.

The FEIS for the PolyMet NorthMet project is aberrant in that it fails to assess any alternatives, including mitigation alternatives, not already included the Proposed Action. The record, including WaterLegacy’s comments and materials provided by Tribal Cooperating Agencies propose less environmentally damaging alternatives. For many of these alternatives, no demonstration has been made either that they are impracticable or that they would have other significant adverse environmental consequences.

The FEIS does not demonstrate that dry stack tailings disposal would be impracticable or have other significant adverse environmental consequences precluding its adoption as a less environmentally damaging alternative to the Proposed Action’s plan to dispose of NorthMet tailings in unlined piles on top of the existing LTVSMC tailings waste storage facility. WaterLegacy’s comments on the adequacy of the FEIS and other record evidence indicate that dry stack tailings disposal on a lined facility at an alternative brownfield site would provide less environmental harm as a result of contaminated seepage site. Dry stack tailings disposal is also the best available technology to reduce the potential for catastrophic dam failure with potentially disastrous environmental consequences. Finally, dry stack disposal in a lined facility on an alternative brownfield site would prevent environmental damage from destruction and indirect adverse effects on wetlands.

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1. Dry stack tailings disposal would reduce adverse impacts from tailings seepage.

The Proposed Action creates a substantial risk of environmental damage from uncaptured seepage that would be mitigated by use of a lined dry stack tailings waste disposal facility. As explained in WaterLegacy’s comments on the FEIS, NorthMet tailings would be deposited in a wet slurry, without a liner, on top of the existing unlined LTVSMC taconite tailings and slimes. (FEIS, 3-104, 3-158, 4-427, 5-5, 5-185, Figure 5.2.14-6). The NorthMet project would produce 110,736 tons of wet tailings slurry per day, of which liquids would be 68.5 percent by weight or 86 percent by volume. (FEIS ref. PolyMet 2015q, autop. 621). The wet slurry tailings waste facility is predicted to produce 3,880 gallons of contaminated seepage minute. (FEIS, 5-179, 5-181), equivalent to 2,041,000,000 gallons of contaminated seepage per year.

PolyMet tailings seepage would be collected from the toe of the tailings heaps and would contain sulfates and heavy metals from copper-nickel processing slurry, effluent from the mine site treatment plant, and LTVSMC tailings. (FEIS ref. PolyMet 2015j, FEIS Figure 3.2-12). PolyMet’s modeling of seepage at the tailings toe is likely to understate actual tailings chemistry. Leachate from copper-nickel *tailings* from MinnAMAX bulk sampling, which were not considered in modeling of NorthMet tailings seepage, contained levels of cobalt more than 30 times the tailings seepage concentration predicted for the NorthMet project, levels of nickel more than 21 times the predicted NorthMet concentrations, and sulfate concentrations more than 11 times higher than predicted NorthMet concentrations. (Johnson, 2015). Solutes in the seepage, including arsenic, mercury, manganese, and lead are known to impair human health; sulfate is known to be toxic to wild rice and to enhance mercury methylation; and metals and salts including copper, nickel, cobalt, lead, mercury, and specific conductance are known to adversely impact aquatic life.

Dry stack tailings disposal reduces seepage rates, as compared with slurry tailings. The Senior Director of Geotechnical Engineering and Hydrogeology for Newmont Mining Corporation has estimated the seepage rate from slurry tailings at 6.4 gallons per minute per acre, the seepage rate from paste or thickened tailings at 0.06 gallons per minute per acre and the seepage from dry filtered tailings at 0.007 gallons per acre.⁸ As compared to dry filtered tailings, this estimate indicated that slurry tailings produce approximately *914 times* as much seepage.⁹

⁸ See John Lupo, Ph.D, P.E., Dry Stack Tailings Overview, slide presentation available at <http://www.slideshare.net/Rosemont-Copper/dry-stack-tailings-overview>

⁹ Conversion site at http://www.convert-me.com/en/convert/flow_rate_volume/gallon_day.html

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The FEIS is insufficient to demonstrate that the significant reduction in tailings seepage that would result from dry stack tailings would not produce a significant environmental benefit. Claims made by the project proponent and adopted in the FEIS of nearly perfect seepage collection fail to consider tailings site hydrogeology, rely on unsubstantiated modeling assumptions and unverified promises of the project proponent, and contradict field experience and its application to the NorthMet tailings site.

Based on the information provided by PolyMet in its Water Modeling Data Package (FEIS ref. PolyMet 2015j) the FEIS claims that, during mine operations, 3,860 gallons per minute of the total 3,880 gpm modeled would be collected. (FEIS, 5-181, Table 5.2.2-37). This would be a nearly perfect collection rate of 99.5%.

To reach this conclusion, the FEIS first assumes that only 200 gpm (0.05%) of total NorthMet tailings seepage will be “surface seepage,” since that is the volume that currently seeps out of groundwater at the toe of the existing LTVSMC basin. (FEIS, 5-179, PolyMet 2015j) Increased seepage and hydraulic head created in the tailings piles during NorthMet operations could result in more water being retained deeper into groundwater. In addition, lack of data on bedrock groundwater precludes calculation of how much groundwater is actually flowing in bedrock at the site. (Lee, FEIS tailings opinion, 2015, p. 4).

Next, based on PolyMet’s underlying analysis (PolyMet 2015j), the FEIS assumes that 100 percent of tailings surface seepage and groundwater seepage would be captured on both the east side and the south side of the tailings piles (FEIS, 5-8, 5-102) and that 100 percent of the “surface seepage” and 90 percent of seepage retained in groundwater would be captured at the north, northwest and west toes of the tailings storage facility. (FEIS, 5-186).

These assumptions are not based on assessment of hydrogeology and run counter to expert opinions from geologists. The FEIS cross-section of the tailings basin groundwater containment system characterizes the bedrock as an “assumed no flow boundary.” (FEIS, Figure 3.2-28) The FEIS also uses mine site Duluth Complex bedrock as an analogy to assume very low hydraulic conductivity at bedrock depths beneath the tailings piles. (FEIS, 4-44). Although the FEIS has estimates flow through the top 20 feet of bedrock at 0.14 feet per day (FEIS, 4-113), neither the FEIS nor the PolyMet reports on which it is based dig any deeper. Beneath the top 20 feet, neither the FEIS nor underlying documents provide any information of any kind in the record on the hydraulic conductivity of tailings site bedrock. (See FEIS ref. Barr 2014b, pp. 21-

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22, Large Figures 1-2). The FEIS also provides *no* investigation of fractures beneath the tailings waste site.

Geologist J.D. Lehr criticized the “simplistic and cursory treatment of the role that bedrock fractures may play in the transmission of groundwater” at the tailings site contained in the PolyMet EIS. (Lehr, 2014, p. 3) Lehr objected to the assumption of a “no-flow boundary” beneath the tailings piles and the resulting implication that groundwater flow through bedrock at the tailings site “is so insignificant that it can be ignored.” (*Id.*) He commented that the failure to identify fractures or assess groundwater flow through fractured bedrock “was a major omission, resulting in unsupported assumptions and inadequate information regarding groundwater flow” at the tailings waste site (*Id.*, p. 4) and raised concerns that neither the project proponent nor the Co-Lead Agencies have required any study of bedrock fractures or their hydrogeologic properties. (*Id.*, p. 15)

Mr. Lehr also criticized the PolyMet EIS for failing to include any hydraulic testing of bedrock in the tailings site area. (*Id.*, p. 12, p. 15) He explained that analogies between Duluth Complex at the mine site and Giants Range Granite at the tailings site cannot be used to assume hydraulic conductivity of bedrock at the tailings site, since Giants Range Granite is 1,600 million years older than Duluth Complex and “would have experienced a different stress, weathering and erosional history than the Duluth Complex.” (*Id.*, p. 15).

Mr. Lehr emphasized that, to assess hydraulic conductivity, “What the SDEIS requires is data.” (*Id.*, pp. 15-16) “Unless a solid scientific basis is provided, the SDEIS’ claims – both explicit and implicit – that groundwater flow through bedrock is minimal, cannot be sustained.” (*Id.*, p. 16). Based on the scientific literature and his professional knowledge of the region’s geology, J.D. Lehr concluded, “bedrock fractures will play a significant role in groundwater and contaminant transport” at the tailings site. (*Id.*, p. 17)

Anthony Runkel, the Chief Geologist for the Minnesota Geological Survey, echoed these concerns, in a opinion on the PolyMet NorthMet SDEIS attached as Exhibit 14. Mr. Runkel stated that the investigations done for the PolyMet mine and tailings site are not sufficient to support the modeling used for the project. He stated that investigations used in similar hydrogeologic settings support conceptual models that differ substantially from those used for the NorthMet project,

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Of particular significance for solute transport, the conceptual models commonly include key fractures or fracture zones of relatively high hydraulic conductivity, and multiple flow systems within the bedrock at individual sites. These flow systems are variably connected to the surface water system, have variable residence times, can have upward and downward vertical gradients within a local area, and horizontal flow directions that differ from one another. (Runkel, 2014, p.1, Exhibit 14)

Mr. Runkel stated that use of a Duluth Complex analogy to assume conditions in tailings site bedrock “is not valid.” (*Id.*, p. 2). He noted that faults are known to be common across much of mapped extent of the Giants Range Batholith, including in the plant site/tailings basin area. Mr. Runkel explained that nearby fractures in the same bedrock have had significant environmental effects, reporting, “Hydraulically significant fractures in the Giants Range Batholith are documented to have transported contaminants at the Northwoods Closed Landfill (MPCA reports) several miles north of the Plant Site/Tailings Basin area.” (*Id.*, p. 3)

The capture efficiencies claimed for the NorthMet tailings site were “provided by PolyMet” (FEIS, A-583) and “justified” “supported” and “assumed” based on the proponent’s modeling. (FEIS, A-578, A-612, 5-77). On the south side of the tailings facility, claims of 100 percent seepage capture are based on a vague promise that unspecified future upgrades by PolyMet will achieve perfect collection: “PolyMet has committed to future upgrades to achieve 100 percent capture by this system if the NorthMet Project Proposed Action is approved.” (FEIS, 3-120, A-84, A-195, A-197, A-616, 3-120).

Since 2011, the current owner, Cliffs Erie, LLC has installed a seepage collection system on the south side of the existing LTVSMC tailings waste facility, at surface discharge location SD026. This system includes a cutoff berm and trench, seep collection sump, pump and pipe system. (PolyMet 2015i). Although neither the FEIS nor PolyMet documents specify what percentage of south tailings seepage is currently collected by Cliffs Erie, water is bypassing the cutoff dam, and improvements in collection would be required to comply with the Cliffs consent decree.¹⁰ “It is acknowledged that there is currently incomplete capture of impacted water at SD026.” (FEIS, A-625). The FEIS provides no evidence that any of the possible engineering alternatives would be effective in capturing *all* seepage that comes to the surface on the south side of the tailings piles (FEIS, 3-120, 5-102) and no mechanism to collect groundwater seepage on the south side of the tailings site is identified. Even though no bedrock

¹⁰ Barr, Water Balance Evaluation of SD026 Seepage Collection System and Cell 1E Pond Water Levels (May 1, 2013); MPCA (John Thomas) letter to Cliffs Natural Resources (Craig Hartmann), April 4, 2013.

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hydrogeology investigation has been done at the tailings waste site, the FEIS assumes, “groundwater migration is not expected to the east or south.” (FEIS, 5-77)

Hydrologist and engineer Don Lee determined after reading the FEIS and supporting documents on tailings basin performance, “The analytical support for these conclusions is based on assumptions of performance that are not justified or supported by data.” (Lee, FEIS opinion, tailings opinion, 2015, p. 1).

The tailings performance claimed is not consistent with field experience or site-specific application. The completed NorthMet tailings piles would be 1,735 feet above sea level, the highest elevation on the landscape (FEIS, 3-104; Figure 4.2.2-17), thus creating hydraulic pressure for seepage. The design basis for the containment system is “to reverse the pre-existing hydraulic gradient (and flow direction) across the facility.” (FEIS, p. A-547). Responses to comments state, “few capture systems have been built with this degree of pumping to cause a reversal of the pre-existing hydraulic gradients” (FEIS, p. A-548), but research has disclosed no similar systems operating long-term to reverse hydraulic gradient.

Field experience and local geological conditions do not support claims made in the FEIS that a bentonite slurry trench will serve as an impermeable “cut-off wall” (FEIS, p. 5-197) or that it could be “keyed into” the tailings site bedrock. (FEIS, p. 5-185). J.D. Lehr explained that the type of bedrock at the tailings site would not be favorable to allow a keyed in trench and large boulders and cobbles known to exist at the site would also impede construction of an effective slurry trench. (Lehr, 2014, pp. 17-18). Dr. Lee noted that the proposed slurry wall at a depth exceeding 40 feet in some locations was a significant undertaking, and that claims that a slurry wall would be nearly impermeable for the indefinite future were not justified. (Lee, tailings opinion, 2015, p. 3). These concerns are similar to those raised by Barr Engineering in a 2007 evaluation report of Tailings Basin Modifications to Eliminate Water Release via Seepage. (FEIS ref. Barr 2007f, p. 21).

The only reference in the FEIS record discussing containment system field experience (FEIS ref. PolyMet 2015h, Attach. D) does not substantiate PolyMet’s claims for tailings seepage capture efficiency. For most of the Barr’s cited examples, no information was available to assess capture success. However, follow-up information was available for one of the two examples highlighted in detail by Barr. Barr had offered the Fort McMurray tailings pond seepage containment system in Alberta Canada as an example of the successful use of slurry

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walls to isolate mine tailings seepage from downgradient water:

Another example is the installation of a soil-bentonite cutoff wall around the perimeter of a mine tailings pond located in the province of Alberta, Canada. The cutoff wall is approximately 100-feet deep and 3 feet wide, and has a hydraulic conductivity of less than 1×10^{-7} cm/sec. The cutoff wall was used to isolate the tailings pond from downgradient surface water features including wetlands and the Athabasca River. (*Id.*, pp. 1-2)

However, information available since 2012 demonstrates that Fort McMurray tar sands tailings seepage containment has been a serious failure. Canadian federal research used chemical profiling to confirm the contaminant source in the Athabasca River and confirmed that toxic chemicals from McMurray Formation oil sand tailings ponds are leaching into groundwater and seeping into the Athabasca River, despite ditches, cutoff walls, groundwater interception wells and a system where captured water is pumped back into tailings ponds.¹¹ One dam has been reported to seep wastewater at a rate of 75 liters per second (625,200,000 U.S. gallons per year) into groundwater feeding the Athabasca River.¹² Industry is working to address the tailings seepage issue, budgeting more than \$1-billion in tailings-reduction technology.¹³

WaterLegacy is unaware of any other data on capture of unlined tailings waste seepage that would support PolyMet's modeling assumptions. In Minnesota, MPCA concluded in 2008 that the maximum estimated percentage of seepage to the Sandy River that could be collected from the unlined Minntac tailings waste facility was approximately 55 to 60 percent.¹⁴ In 2013, U.S. Steel confirmed that the dike and pump back system on the east side of the Minntac facility was collecting roughly 50 percent of the total seepage volume.¹⁵ After extensive research, the highest rate of seepage capture identified for any unlined facility using slurry walls appears to have been at the Hill Air Force Base in northern Utah, where a combination of the slurry walls,

¹¹ Frank et al., *Profiling Oil Sands Mixtures from Industrial Developments and Natural Groundwaters for Source Identification*, Env. Sci & Tech. accepted Jan. 21, 2014. Available at <http://www.thetyee.ca/Documents/2014/02/21/Profiling-Oil-Sands-Mixtures.pdf>; Bob Weber, *Federal study says oil sands toxins are leaching into groundwater, Athabasca River*, Edmonton Globe and Mail, Feb. 20, 2014. Available at <http://www.theglobeandmail.com/news/national/federal-study-says-oil-sands-toxins-are-leaching-into-groundwater-athabasca-river/article17016054/>

¹² Andrew Nikiforuk, *Large dams of mining waste leaking into Athabasca River study*, Feb. 21, 2014, <http://thetyee.ca/Blogs/TheHook/2014/02/21/Tailings-Waste-Athabasca/>

¹³ Weber, *supra* note 4.

¹⁴ MPCA (John Thomas) letter to Tom Moe (U.S. Steel Corporation) of Jan. 10, 2008, available at http://waterlegacy.org/sites/default/files/PolyMet_SuppEIS/WL_Ex19_MPCA_MinntacSeepLtr_2008.pdf

¹⁵ U.S. Steel (Chrissy Bartovich) letter to U.S. Army Corps of Engineers, July 9, 2013, letter with attachment excerpt available at http://waterlegacy.org/sites/default/files/PolyMet_SuppEIS/WL_Ex20_U.S.Steel_MinntacLtr_2013.pdf

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landfill covers, groundwater interception and extraction wells, and treatment succeeded in reducing metals concentrations from a Superfund site by 80 percent.¹⁶

In the EPA’s recent Pebble Mine assessment, the Agency recently concluded, “Water collection and treatment failures are a common feature of mines.”¹⁷ EPA stated that the probability of potential *failure* of water collection and treatment during operations is 93 percent, and results include “exceedance of standards potentially including death of fish and invertebrates.” Post-closure probability of failure of water collection and treatment was “somewhat higher than operation,” and “failures are likely to result in release of untreated or incompletely treated leachates for days or months. If the site were to be abandoned, EPA noted that failure of water collection and treatment was “certain.”¹⁸

The FEIS identifies several likely failures of the proposed tailings seepage collection system: new surface seepage locations may emerge as the tailings basin is developed; tailings pond water quality may be worse than expected; and groundwater or surface water downgradient of the tailings basin may fail to comply with water quality standards. (FEIS, 5-239 to 5-240). Such failures may or may not be revealed by monitoring, may be revealed only after irreparable harm has been caused to fish, wild rice or human beings or may only come to light after mining has ceased and the mining company declares bankruptcy to avoid responsibility.

Based on reasonable tailings seepage rates that consider the uncertainties of unknown hydrogeology, the limits of engineered systems to reverse hydraulic flow over the long term, the permeability of proposed containment mechanisms, and field experience with seepage capture from unlined facilities, an lined dry stack tailings facility would reduce adverse environmental effects from tailings seepage.

2. Dry stack tailings disposal would reduce the threat of catastrophic tailings dam failure.

The Proposed Action also creates a reasonably foreseeable risk of catastrophic dam failure that would be markedly reduced, if not eliminated, were the best available technology of dry stack tailings in a lined facility used to store NorthMet tailings. International headlines,

¹⁶ EPA, *Engineering Bulletin Shurry Walls* (October 1992), p. 5, available at <http://nepis.epa.gov/Exe/ZyPDF.cgi/10002DPY.PDF?Dockey=10002DPY.PDF>

¹⁷ EPA, *An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska*, Volume 1 – Main Report (EPA 910-R-14-001A (January 2014), p. 8-19, available at http://www2.epa.gov/sites/production/files/2015-05/documents/bristol_bay_assessment_final_2014_voll.pdf

¹⁸ *Id.*, Table ES-4 and Table 14-1

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research reports and expert opinions over the past year and a half underscore the fact that catastrophic failure of mine tailings dams is a significant and foreseeable risk.

On Monday, August 4, 2014, on a sunny summer day, the tailings dam at the Mount Polley copper-mine in British Columbia, Canada collapsed. The breach released an estimated 24.4 million cubic meters (6.3 billion gallons) of tailings and wastewater into Polley Lake, which rose by 1.5 meters. Hazeltine Creek, which flows out of Lake Polley, was transformed from a 2-metre-wide stream to a 50-metre-across "wasteland" and Cariboo Creek was also affected. By August 8, the spill had reached Quesnel Lake, considered until then one of the cleanest deep-water lakes in the world.¹⁹

One year later, water quality in 70-kilometer once-pristine Quesnel Lake had changed. After the dam collapse, Imperial Metals supplied drinking water and acknowledged that tailings contained arsenic and lead. The Interior Health Authority issued a bulletin not to eat the fish in Quesnel Lake due to mercury.²⁰

On November 6, 2015, an iron ore tailings dam collapsed at the Samarco mine in Brazil. The dam collapse started a mudslide that flattened a village of 600 people and killed 17 people. An estimated 60 million cubic meters (nearly 16 billion gallons) of mine waste were released, requiring 600 people to be evacuated.²¹ On November 30, 2015, Brazil announced that they would file a \$5.2 billion lawsuit against the BHP mine company. A large number of fish have died.²² Laboratory testing in downstream samples of water from the impacted Rio (River) Doce has detected mercury, aluminum, iron, lead, boron, barium, copper, arsenic and other chemicals. Arsenic in the sampling was 2,639.4 micrograms per liter -- more than 200 times Brazil's 10 micrograms per liter standard.²³

¹⁹ Gordon Hoekstra, Mount Polley mine tailings spill nearly 70 percent bigger than first estimated, Vancouver Sun, Sept. 3, 2014, http://www.vancouversun.com/Mount+Polley+mine+tailings+spill+nearly+cent+bigger+than+first+estimated/10172302/story.html?__lsa=3d36-42fe#ixzz3VcdRA2uw

²⁰ Rod Marining, One year later, *Wilderness Committee*, August 1, 2015, http://commonground.ca/OLD/iss/289/cg289_MtPolley.shtml; Monica Lamb-Yorski, Mine still supplying drinking water to Quesnel Lake residents, *Williams Lake Tribune*, Jan. 15, 2015, <http://www.wltribune.com/news/288759341.html>

²¹ Kathryn Diss, Samarco mine tragedy: BHP 'deeply sorry' for Brazil dam disaster, pledges review of operations, ABC News, Nov. 19, 2015, <http://www.abc.net.au/news/2015-11-19/deeply-sorry-bhp-announces-mines-review-after-dam-disaster/6955084>

²² Esmarie Swanepoel, BHP says Brazil plans \$5bn legal suit over Samarco disaster, Nov. 30, 2015, <http://www.miningweekly.com/article/bhp-says-brazil-plans-5bn-legal-suit-over-samarco-disaster-2015-11-30>

²³ Paula Stange, Analysis indicates the presence of mercury, arsenic, iron and lead in the water do Rio Doce, *GazetaOnline*, Nov. 12, 2015, <http://agazeta.redegazeta.com.br/conteudo/2015/11/noticias/cidades/3914468-analise-aponta-presenca-de-mercurio-arsenio-ferro-e-chumbo-na-agua-do-rio-doce.html>

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These may be particularly gripping examples, but they are not uncommon. A July 21, 2015 report by Lindsay Bowker and David Chambers, *The Risk, Public Liability & Economics of Tailings Storage Facility Failures* (hereinafter “TSF Failures”, attached as Exhibit 19) analyzed recorded tailings storage facility failures from 1940 to 2010 using statistical tools. They found an emerging and pronounced trend since 1960 toward a higher incidence of Serious failures, i.e. large enough to cause significant impacts or involved loss of life and Very Serious failures, i.e. catastrophic dam failures that released more than 1 million cubic meters of tailings and in some instances resulted in multiple loss of life. 63% of all incidents and failures since 1990 were Serious or Very Serious. The total costs for just 7 of these 16 large failures was \$3.8 billion, at an average cost of \$543 million per failure. (Bowker & Chambers, *TSF Failures*, pp. 1-2, Exhibit 19)

The *TSF Failures* report identified factors contributing to the increase in catastrophic dam failures: mining lower grades and falling real prices of metals, pushing older tailings storage facilities to unplanned heights, or stretching the limits of tailings storage facilities that were not built or managed to best practices in the first place. (*Id.*, pp.1, 2,16). These risk factors would all apply to the PolyMet tailings facility.

Although the *TSF Failures* analysis did not cover the past few years, the World Information Service on Energy (WISE) has prepared chronology of major dam failures through mid-November 2015, attached as Exhibit 20. Since 2010, WISE has identified 12 major tailings dam failures, including failures in Canada, the United States, and Europe.

David Chambers’ provided expert “Comments on the Geotechnical Stability of the Proposed NorthMet Tailings Basin and Hydrometallurgical Residue Facility in light of the Failure of the Mt Polley Tailings Storage Facility” in April, 2015. (Chambers, 2015, attached as Exhibit 21) Dr. Chambers noted that tailings dams fail at a rate that is approximately 10 times higher than that of water supply reservoir dams. (*Id.*, p.2) He stated that upstream-type dam construction used for the existing LTVSMC tailings and proposed for NorthMet tailings poses the highest risk for both seismic and static failure of tailings dams. (*Id.*, pp. 2-3) Dr. Chambers highlighted the presence of a clay layer beneath a portion of the Mount Polley dam as a significant cause of its failure, explaining that the LTVSMC tailings slimes on which PolyMet’s tailings dams will be built have a consistency and behavior similar to clays. (*Id.*, p. 3).

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The FEIS confirms that the LTVSMC dam was built with upstream construction and that PolyMet will use upstream construction for its tailings storage on top of these old dams. (FEIS, 4-439, 5-646). The FEIS also notes that there were times during the operation of the underlying LTVSMC tailings facility where “significant amounts of fine tailings and slimes” settled near the perimeter dams and dams were then built with coarse tailings on top of them. (FEIS, 4-427) This inclusion of “relatively large zones” of fine tailings and slimes in the dam’s outer shell “reduces the drainage ability of the shell, increasing the phreatic surface, and reduces the localized shear strength” of the dam. (*Id.*)

The FEIS identifies the northern dam in Cell 2E as an area of potential weakness since it is “underlain by a layer of fibrous peat up to approximately 20 ft thick that extends north beyond the toe of the dam into a nearby wetland and due to the presence of interbedded layers of contractive fine tailings and slimes.” A deposit of glacial till lies beneath the peat, and the crest of the dam in this area is about 90 feet above the surrounding ground surface and “consists mostly of coarse tailings with some weaker layers of interbedded fine tailings and slimes close to the base of the dam.” (FEIS, 4-437) Fully liquefied, this cross-section of the dam (Section F) has a margin of safety at barely the 1.1 minimum required. (FEIS, 5-658, Table 5.2.14-1)

Although the FEIS does not include any dam break analysis (FEIS, 5-628), PolyMet’s Flotation Tailings Management Plan (PolyMet 2015n) states that there are 34 homes that could be affected by a tailings dam break, and that the time to first arrival of flood flows at the nearest residence would be about an hour. (*Id.*, p. 20, see Exhibit 22 for map).

After the Mount Polley dam failure, an independent panel of experts studied the breach and released a report, The Independent Expert Engineering Investigation and Review Panel *Report on Mount Polley Tailings Storage Facility Breach* (hereinafter “Independent Report”) attached as Exhibit 25. The *Independent Report* analyzed the cause of the Mount Polley tailings impoundment failure and concluded, “the dominant contribution to the failure resides in the design.” The *Report* made the following key recommendation:

[T]he future requires not only an improved adoption of best applicable practices (BAP), but also a migration to best available technology (BAT). Examples of BAT are filtered, unsaturated, compacted tailings and reduction in the use of water covers in a closure setting. (*Id.*, at iv)

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The *Independent Report* explained, “There are no overriding technical impediments to more widespread adoption of filtered tailings technology.” (*Id.*, at 122) Its Expert Panel challenged the practice of maintaining a water cover over tailings to reduce reactivity, stating that so-called water cover runs counter to best available technology principles and that “No method for achieving chemical stability can succeed without first ensuring physical stability.” (*Id.*, at 124). The *Independent Report* explained the “intrinsic hazards associated with dual-purpose impoundments storing both water and tailings” and identified as the goal of best available technology for tailings management “to assure physical stability of the tailings deposit. This is achieved by preventing release of impoundment contents, independent of the integrity of any containment structures.” (*Id.*, at 121) To accomplish this objective, the Report continued, “BAT has three components that derive from first principles of soil mechanics: 1. Eliminate surface water from the impoundment. 2. Promote unsaturated conditions in the tailings with drainage provisions. 3. Achieve dilatant conditions throughout the tailings deposit by compaction.” (*Id.*)

The *Report’s* expert panel recognized that the chief reason why there isn’t wider industry adoption of filtered tailings is that comparisons of capital and operating costs alone favor conventional tailings dam. The *Independent Report* recommended that cost estimates include “risk costs, either direct or indirect, associated with failure potential,” emphasizing, “Full consideration of life cycle costs including closure, environmental liabilities, and other externalities will provide a more complete economic picture. While economic factors cannot be neglected, neither can they continue to pre-empt best technology.” (*Id.*, at 123). The *Report* concluded that “BAT should be actively encouraged for new tailings facilities at existing and proposed mines” and “cost should not be the determining factor.” (*Id.*, at 125)

The alternative of dry stack tailings was not evaluated at any point in environmental review. The Draft EIS screening process found thickened (not dry stack) tailings would address tailings basin mitigation issues, but “the operational cost of this measure would be high.” (MDNR and USACE, 2009, 3-56, Table 3.2-2). Although Co-Lead Agency responses to comments state that after the DEIS a dry tailings alternative was reconsidered and determined not to offer significant environmental benefits, (FEIS, A-315) there is no such analysis in the SDEIS, the FEIS or any cited reference.

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The FEIS states that the *Independent Report* on Mount Polley was after the SDEIS comment period ended and Co-Lead Agency technical analysis confirmed, “use of dry stacking technology would increase tailings basin stability.” Further evaluation of this alternative was rejected, however, on the grounds that use of dry stacking requires a basin liner, which is not feasible on top of the existing LTVSMC tailings basin. Use of a different location and a lined dry stack facility was then rejected on the grounds, “A separate dry stack tailings basin would increase footprint effects of the project” and that “A separate dry stack tailings basin would not address LTVSMC tailings basin legacy issues.” (FEIS, A-315).

A separate dry stack tailings basin might increase the “footprint” of the project, but need not have any adverse environmental effects. During the scoping process for the PolyMet project, several brownfield sites in close proximity to the LTVSMC plant were identified as alternative tailings locations. This map of Alternative Sites under Consideration is attached as Exhibit 27. Addressing LTVSMC legacy issues is outside the scope of factors pertinent to a Section 404 permit decision, particularly since Cliffs Erie is already required under applicable law and a consent decree, to address legacy issues irrespective of the PolyMet NorthMet proposal.

3. An alternative site for dry stack tailings would prevent adverse impacts to wetlands.

In addition to environmental damage due to uncaptured seepage and the reasonably foreseeable environmental damage from catastrophic dam failure, the proposed use of the LTVSMC site for NorthMet tailings disposal would have substantial direct and indirect impacts on wetlands. The Proposed Action would result in direct destruction of 148.4 acres of wetlands (FEIS, 5-322, Table 5.2.3-8) and potentially impact thousands of additional acres of wetlands as the result of dewatering resulting from seepage collection, sulfate deposition and seepage impacts on water quality. (See FEIS, 5-333, Table 5.2.3-10; 5-345, Table 5.2.3-12).

Tailings site wetlands, through degraded as the result of the existing impoundment, are historical wetlands. (Exhibit 13 maps). They are also highly methylating environments, particularly sensitive to changes in hydrology resulting in drying and wetting cycles, as explained in the opinion of Brian Branfireun, an international expert on mercury, methylmercury and wetlands. (Branfireun, 2015).

There are many alternative sites in the vicinity of the LTVSMC processing plant that could be used for PolyMet NorthMet tailings, some of which have been identified on Exhibit 27.

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Tailings disposal does not require siting within wetlands to fulfill its basic purpose. In fact, siting within wetlands is arguably inimical to the purpose of containing these wastes. Thus, it must be presumed under applicable regulations, that practicable alternatives that do not involve special aquatic sites are presumed to be available, unless clearly demonstrated otherwise, and all practicable alternatives to the proposed discharge which do not involve a discharge into a special aquatic site are presumed to have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise. 40 C.F.R. §230.10(a)(3).

The Co-Lead Agencies' arguments for rejecting the alternative of dry stack tailings disposal on a lined facility without any evaluation are spurious. They fail to demonstrate, pursuant to 40 C.F.R. §230.10(a), either that dry stack tailings disposal for NorthMet tailings is impracticable or that this best available technology would have other adverse environmental consequences. Independent of the environmental damage that would result from contaminated seepage and from the reasonably foreseeable risk of catastrophic dam failure, federal regulations presume that location of the NorthMet tailings storage facility on a site that did not directly destroy 148.4 acres of wetland and adversely affect thousands more is practicable and presumed to have less adverse impact, unless clearly demonstrated otherwise. This has not been done.

D. The West Pit Backfill alternative would have less adverse impact on the aquatic ecosystem and it has not been demonstrated this alternative is impracticable.

The FEIS erroneously minimizes the significance of West Pit Backfill in mitigating environmental damage resulting from the NorthMet mine and stockpiling of Category 1 waste rock. The FEIS acknowledges that this alternative would allow for reclamation of the 526-acres surface and the restoration of wetland areas and functions, but discounts the value of that restoration, as follows:

Removal of the Category 1 Stockpile would allow for reclamation of the affected surface footprint, including potential to recreate wetland areas and restore function, and, as noted above, the prior effect would have been offset through mitigation required for the initial effect. . . . However, because of the temporal effect that the stockpile would have, those effects would be required to be mitigated regardless of future backfilling or not. (FEIS, 3-161 to 3-162)

Although the project proponent may see no value in future wetlands restoration if no mitigation credit is received, this perspective is untenable. There is an environmental benefit to

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the watershed of long-term reclamation, particularly when such a large site has been removed from the natural ecosystem.

The FEIS identifies additional benefits from improvement of visual aesthetics and a measurable environmental benefit from not having to treat seepage from the Category 1 Stockpile. (FEIS, 3-161).

The FEIS fails to consider an additional aquatic ecosystem environmental benefit of the West Pit Backfill alternative. It would reduce contaminated seepage that would otherwise result from leaving the 526-acre Category 1 copper-nickel waste rock pile permanently in a 280-foot-tall unlined pile at the mine site where seepage could impact the 100 Mile Swamp and the Upper Partridge River. (FEIS, 5-119, Table 5.2.2-21) The hydrogeologic conditions beneath the unlined Category 1 waste rock piles are not discussed in the FEIS. But comparing the Mine Site Plan (FEIS, Figure 4.2.14-1) with figures in the Barr Hydrogeology of Fractured Bedrock report (FEIS ref. Barr 2014b, Figures 1 and 2, Exhibit 3) shows that the majority of the Category 1 waste rock pile would be located on Virginia Formation rock, rather than less hydraulically conductive Duluth Complex rock. There are two faults confirmed by Barr and at least one additional inferred fault transecting the proposed site for the Category 1 waste rock pile. (*Id.*)

The FEIS predicted, based on PolyMet’s modeling and assumptions (PolyMet 2015h), that more than 98 percent of affected groundwater seepage from the Category 1 stockpile would be captured by the containment system or would migrate as groundwater into the West Pit and East Pit. (FEIS, 5-7). PolyMet’s modeling (PolyMet 2015h), also adopted in the FEIS, predicted that only negligible volumes of uncaptured seepage would flow north. (FEIS, 5-65).

Reference documents undermine these claims for seepage collection. Although the FEIS refers to the containment to be installed to collect seepage as a “low-permeability cut-off wall keyed into bedrock” (FEIS, 5-7), the actual design provides for the use of “compacted soil” as a barrier around the waste rock pile. (FEIS ref. PolyMet 2015h, p. 10). Specifications for the hydraulic conductivity are 1×10^{-5} centimeters per second (*Id.*, p. 13), which is generally classified as “semi-permeable” soil.

The drainage system would consist of pipes and ditches and rely only on gravity for collection. (*Id.*, p. 14). PolyMet admits that along the west, north, and east sides of the stockpile, there may be localized areas where the drain pipe cannot be installed at an elevation low enough to ensure that groundwater will not flow beneath the cutoff wall. It does not appear that these

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seepage areas are counted in its modeling. Instead, “PolyMet assumed that water collection performance monitoring points will be defined in SDS permitting to confirm (via monitoring differential hydraulic head) whether or not post-construction seepage loss is occurring beneath the cutoff wall. *If monitoring confirms that seepage losses are occurring to an extent potentially detrimental to water quality*, then groundwater recovery wells can be installed to supplement the containment system. (*Id.*, emphasis added)

The FEIS’ predictions of minimal Category 1 seepage flow were also based on assumption that the cover placed on the rock pile would reduce infiltration by more than 99 percent (from 360 gpm to 2.8 gpm). (FEIS, 5-145). PolyMet’s document from which this conclusion is drawn admits that geomembranes have not been used for many waste rock stockpile covers and that use is generally limited to projects with an average size of less than 30 acres. (PolyMet 2015d, p. 45). Yet, PolyMet (2015d) and the FEIS calculate infiltration solely on the basis of liner defects per acre of liners, without considering the topography of massive waste rock piles. PolyMet identifies three mine sites where geomembranes have been used as a cover, but does not describe seepage results. One of these featured sites is the Dunka Mine (*Id.*, p. 46). Unsurprisingly, the FEIS does not cite the Dunka Mine in its predictions that infiltration and seepage will be prevented. Despite its geomembrane, Dunka Mine waste rock seepage has resulted and continues to result in ongoing violations of Minnesota water quality standards for copper, nickel, hardness and specific conductivity. (See Dunka Mine DMR summaries, provided in Exhibit 34)

Recent documents have also challenged the FEIS’ assumption that little seepage would flow north from the Category 1 waste rock pile. As described in WaterLegacy’s comments on the FEIS, preliminary MODFLOW modeling by the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) suggests that contaminants in the NorthMet mine surficial aquifer could flow northward as a result of the increase in pit depth and future closure of the Peter Mitchell Pit, given the proximity of the Category 1 stockpile (0.8 miles) to the Peter Mitchell Pit and the experience with other taconite pits where a cone of depression affecting surficial water can extend 1.4 to 1.5 miles from the pits. (GLIFWC Northward Flowpath Letter, Exhibit 8, p. 5).

Placing Category 1 in the Duluth Complex rock West Pit, after grouting any fractures revealed by mining, would reduce adverse effects from uncaptured release of contaminated seepage to surface and groundwater. Maintaining saturated conditions to reduce oxidation may

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also be more effective within the West Pit than trying to do so with a cover on a tiered pile.

The FEIS suggests that the environmental benefits from the West Pit Backfill alternative do not require its consideration, let alone implementation of this alternative:

The potential environmental benefit is moot or outweighed because encumbrance is not allowed in PolyMet's private mineral leases and because the costs associated with backfilling, additional water treatment (rates), and encumbrance compensation determined in revised lease agreements may affect the ability of PolyMet to secure financing (MDNR et al. 2013b). As such, the option to backfill the West Pit was eliminated from further consideration in the SDEIS and remains so in this FEIS. (FEIS, 3-162)

The referenced 2013 MDNR memorandum cited the conclusion of PolyMet's consultants that the West Pit Backfill alternative "would significantly decrease net return on the project." (FEIS ref. MDNR et al., 2013b, p. 3). PolyMet's consultants has emphasized, "There are known extensions of mineralization outside the mine plan both to the south (down dip) and to the west (along strike). A key consideration in the development of an overall mine plan for the Project, including the ability to backfill open pits, is preserving potential future development of these extensions of mineralization."²⁴

The project proponent's interests in a better financial return or avoiding renegotiation of leases do not render the West Pit Backfill alternative impracticable under 40 C.F.R. § 230.10(a)(2). In addition, the "key consideration" relevant to PolyMet in opposing this alternative - preserving future development of extensions of mineralization outside the pit boundary – if it is considered as part of the project purpose for rejecting the West Pit Backfill Alternative, must also serve to define the project purpose for evaluating the Underground Mining Alternative.

E. The Reverse Osmosis in Year 1 alternative would have less adverse impact on the aquatic ecosystem and it has not been demonstrated this alternative is impracticable.

Both WaterLegacy and Cooperating Tribal Agencies requested consideration of an alternative to mitigate impacts on wetlands and water quality from mine dewatering and seepage by treating groundwater pumped from mine pits during operations with reverse osmosis to levels that comply with water quality standards and returning that treated water to support wetlands and

²⁴ Foth, Evaluation of Backfilling the NorthMet West Pit, prepared for PolyMet Mining, Dec. 2012. p. 8, provided with WaterLegacy SDEIS Comments as Exhibit 49.

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dilute any seepage released to the Partridge River watershed. The FEIS doesn't mention this alternative. Although the request for consideration of this alternative is mentioned in two responses to comments, neither response substantively addresses the Reverse Osmosis in Year 1 alternative. (FEIS, A-134 to A-135, A-313).

The NorthMet Proposed Action currently calls for construction of reverse osmosis (RO) water quality treatment at approximately year 52 (FEIS, 5-142). That RO facility would be scaled to treat overflow discharge from the West Pit. Prior to the predicted filling of the West Pit, at least 52 years away (more if mining is continued for more than 20 years), all water from the Upper Partridge River would be sent to the processing plant nine miles away and removed from the watershed.

The treatment targets for the mine site wastewater treatment plant from year 1 to at least year 52 would not permit discharge of treated water to surface water. Based on current baseline hardness in the proposed West Pit Outlet Creek of less than 50 mg/L (FEIS, 4-91, Table 4.2.2-15), the mine site wastewater treatment facility (WWTF) target for lead (10 µg/L) would be more than 7 times the water quality standard; the WWTF target for nickel (113 µg/L) would be nearly 4 times the water quality standard, and the WWTF target for sulfate would be 250 mg/L, 25 times the standard applicable in wild rice (FEIS, 5-148, Table 5.2.2-29). The predicted mercury concentration in WWTF effluent would be 5.8 ng/L, nearly 5 times the Great Lakes Initiative water quality standard of 1.3 ng/L. (See PolyMet RS66, Mercury Mass Balance Attach. A, Exhibit 4 to WaterLegacy SDEIS Comments) This low-quality effluent could not be used to augment the aquifer to protect wetlands from water drawdown or to mitigate mine site seepage impacts.

Where wetlands near the tailings site in the Embarrass River watershed are concerned, the FEIS has already proposed that stream augmentation would mitigate effects on wetlands due to the maintenance of surface flows within 20 percent of existing conditions. (FEIS, 5-183). Yet, although wetlands at the plant site are degraded by the existing impoundment (FEIS, 4-186) and wetlands at the mine site are high quality (FEIS, 5-266), the proposed action makes no plan to treat and return water to the mine site watershed.

Indirect impacts on mine site wetlands as a result of mine dewatering are likely to be quite severe. As noted above, mine dewatering could adversely affect 5,720 acres of proximate wetlands. (FEIS, App. C, autop. 2994) PolyMet has recently re-evaluated the hydraulic

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conductivity of both wetlands and rock formations at the mine site. Although conductivity of Duluth Complex rock was unchanged in this analysis, the conductivity of both wetlands deposits (horizontal conductivity) and Virginia Formation bedrock (both horizontal and vertical conductivity) was calculated at *400 percent* of the conductivity modeled in the 2013 SDEIS. (Comparison is based on SDEIS, 5-27, Table 5.2.2-7 and FEIS, 5-29 Table 5.2.2-7). As a result, peak inflows and dewatering of the Partridge River watershed could be as much as 760 gallons per minute (FEIS, 5-111, Table 5.5.2-19) or 399,700,000 gallons per year removed from mine site groundwater.

Mine site Reverse Osmosis in Year 1 could return treated, clean water to mine site streams and surficial aquifer mitigating indirect impacts of wetlands drawdown. Reduction in the degree to which mine site wetlands were impacted by hydrologic change would have the potential to mitigate the degree to which mine site wetting and drying cycles enhance mercury methylation. In addition, if PolyMet's modeling of the volume, timing or solute concentrations of polluted seepage at the mine site has underestimated environmental effects, the Reverse Osmosis in Year 1 alternative would allow discharge of clean water to mitigate impacts while additional engineering solutions to prevent seepage are put into place.

Since construction of a reverse osmosis plant at the mine site is already planned post-closure, at a time when PolyMet would have fewer economic resources than during operations, it should be presumed that earlier construction and operation of the plant would be practicable. As with other alternatives that clearly reduce adverse effects on the ecosystem, the burden of proof would be on the project proponent to demonstrate that Reverse Osmosis in Year 1 is not a practicable alternative to mitigate some of the impacts to wetlands and water quality of the proposed NorthMet project.

F. Hydrometallurgical waste disposal on an alternative site would have less adverse impact on the aquatic ecosystem, and it is presumed that other sites are practicable and less impactful.

The NorthMet hydrometallurgical residue facility (HRF) would be a relatively small facility, when compared to the NorthMet tailings waste storage facility. However, the NorthMet hydrometallurgical residue facility (HRF) would contain some of the most concentrated and toxic chemicals involved with the project. It is proposed to be located 36.1 acres of wetlands,

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requiring the destruction of 7.5 acres of marsh wetlands subject to state and federal regulatory jurisdiction. (FEIS, 5-321, Figure 5.2.3-19).

The HRF would receive 313,000 tons per year of hydrometallurgical residue produced by autoclave processing of metals at the Hydrometallurgical Plant and up to a total of 6,170,000 tons of this waste. (FEIS, 1-5, 3-117). During operations, the HRF would also receive filtered sludge produced by chemical precipitation of process water in the West and East equalization ponds. This process water would include the reject concentrate stream from the plant site wastewater treatment plant (WWTP). (FEIS, 5-101, Figure 5.2.2-20). The FEIS also proposes disposal in the HRF of WWTP treatment plant solids, which are primarily gypsum, and of coal ash wastes from the existing LTVSMC site Coal Ash Landfill. (FEIS, 5-178, PolyMet 2014c). These additional and potentially toxic and reactive wastes, may represent up to 10 percent of the HRF facility solids volume. (FEIS, 4-445).

The FEIS concludes that HRF waste will not exceed federal RCRA hazardous waste thresholds, without disclosing the mass or concentration of any of the constituent wastes that would be disposed of in this facility. Rather than assessing the contaminant levels actually proposed for the HRF under the current project plan, the FEIS states that, if the project is approved, the residue should be tested to verify that it is not hazardous. (FEIS, 5-609).

No supporting documents fully disclose the chemical constituents of the hydrometallurgical residue facility. However, the little information available confirms that the constituents of the HRF would pose serious risks to the aquatic ecosystem and to human health if they were ever to leak or spill. Co-Lead Agency responses to comments state that 164 pounds of mercury would be deposited in the hydrometallurgical facility each year. (FEIS, A-414). Over a 20-year mine life, up to 3,280 pounds of mercury could be deposited in the HRF.

The February 2007 PolyMet RS33/RS65 Hydrometallurgical Residue Characterization (provided as Exhibit 27 to WaterLegacy SDEIS comments although not included among FEIS references) indicated that tested hydrometallurgical leachate residue would have sulfate levels of 7,347 mg/L. Although we have found no document in the EIS record that provides contaminant levels for filtered sludge, before WWTP reject concentrate is dewatered it would contain levels of arsenic and metals as much three orders of magnitude above applicable limits. At the P90 level, reject concentrate would contain: 1,150 µg/L of arsenic (2 µg/L criterion for drinking water); 16,600 µg/L of manganese (100 µg/L HRL for drinking water); 847 of cobalt (5 µg/L

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surface water limit); 11,600 µg/L of copper (9.3 µg/L limit in water with 100 mg/L hardness); 1,290 µg/L of lead (3.2 µg/L limit in water with 100 mg/L hardness); 8,230 mg/L of sulfate (10 mg/L limit in wild rice waters). (FEIS ref. PolyMet 2015m, autop. 452).

The FEIS assumes that leakage from the HRF into underlying groundwater or adjacent surface water “would be negligible” due to the double liner proposed and does not evaluate potential environmental impacts from HRF waste facility seepage. (FEIS, 5-179). This assumption is based on a referenced PolyMet document which states, “The double liner system designed for the HRF is impermeable enough so that its effect on the environment can be ignored.” (PolyMet 2015j, p. 117). PolyMet assumes a leakage rate of 2 defects per acre in the upper liner of the HRF, that defects are circular with a diameter of 1 centimeter, and that no defects at all will occur in the lower clay liner. (*Id.*) However data in PolyMet’s own Residue Management Plan suggests that 40% of installed liners have a defect density from 4 to 10 per acre and 10% a defect density from 10 to 20 per acre. (FEIS ref. PolyMet 2014r, p. 11). Although the hydraulic head between the upper and lower HRF liner may be low, leakage could still occur.

Neither the FEIS nor its underlying PolyMet documents address the difference between the HRF proposal and modern landfill siting and performance. Modern landfills, on which the optimistic expectations of HRF leakage performance are based, cannot be sited on locations like the one proposed in the FEIS. As summarized on the EPA website, municipal solid waste landfills must comply with the federal regulations in 40 C.F.R. § 258 (Subtitle D of RCRA), or equivalent state regulations. Federal standards for solid waste landfills include: “Location restrictions—ensure that landfills are built in suitable geological areas away from faults, wetlands, flood plains, or other restricted areas.”²⁵ Minnesota law similarly precludes the siting of either a hazardous or a solid waste facility in a wetland or in a location where the topography, geology, hydrology or soil is unsuitable for the protection of the ground water and the surface water. Minn. R. 7045.0460, Subp. 2, Minn. R. 7035.1600.

The FEIS and supporting documents demonstrate that the proposed hydrometallurgical residue facility would be sited in an unsuitable location for either a hazardous or an industrial waste landfill. The HRF would be located on approximately 36.1 acres of wetlands, affecting the foundation of the disposal facility as well as implicating Section 404 regulations. In addition to

²⁵ EPA, Landfills, available at <http://www3.epa.gov/epawaste/nonhaz/municipal/landfill.htm>. See also 40 C.F.R. §257.9 for restrictions on location of new or expanding non-municipal, non-hazardous waste facilities on wetlands.

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the wetlands, the HRF would be located on top of as much as 50 feet of fine tailings and slimes in the existing LTVSMC Emergency Basin. (FEIS, 5-664, Fig. 5.2.14-9). Although the FEIS proposes that a preload could be placed on these materials to compress them in order to reduce stress deformation and strain on the liner system, it is expected that the material would rebound to some degree after the preload is removed. (FEIS, 5-667). Differential settlement of foundation materials is known to create longitudinal strain for liner materials. (FEIS, 5-661).

The FEIS and Minnesota Geological Survey maps show the existence of a fault directly beneath the proposed HRF location. (FEIS, 4-435, Barr 2014b Large Figures 1 and 2, Exhibit 3). The FEIS has identified yet another risk to liner deformation and integrity. Seeps along the southern edge of the existing LTVSMC tailings basin Cell 2W have been observed with the potential to create phreatic build-up below the HRF liners. The HRF would require a collection drain beneath the proposed embankment and liner systems to transmit the collected seep to the exterior of the HRF facility and reduce this risk. (FEIS, 5-662 to 5-663)

Although the degree to which leakage and seepage of concentrated and toxic chemicals would adversely affect aquatic ecosystems is difficult to quantify given the lack of information in the FEIS, there is a clear environmental benefit to locating the hydrometallurgical residue facility on a site with a level, stable and dry foundation, where predictions of infrequent leakage are much more likely to be realized. More effectively containing mercury, arsenic, manganese, cobalt, copper, lead and sulfate so that they are not released to surface water and groundwater would reduce impacts on the aquatic ecosystem and human use characteristics, pursuant to Subparts C and F of Chapter 40, Part 230 in these rules.

The FEIS contemplates that “liquefaction of the hydrometallurgical residue” may occur, but states that the embankment dam is “sufficiently designed so that containment would not be lost.” (FEIS, 5-664) The liquefaction and failure of containment at the hydrometallurgical residue facility may or may not be a likely occurrence. But it would be a catastrophic occurrence that can be readily avoided by siting the HRF on an appropriate site that is not located on wetlands.

Disposal of hydrometallurgical residue and other wastes is not an activity that requires siting within wetlands. In fact, it is an activity generally *prohibited* in wetlands. Thus it is presumed that sites for the HRF that do not involve wetlands are available and would have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise. 40 C.F.R.

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§230.10(a)(3). There are many sites that do not involve wetlands in the vicinity of the proposed NorthMet processing plant (see for example, brownfield sites identified in Exhibit 27) that could accommodate the small footprint of the proposed NorthMet HRF facility.